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ABSTRACT

An experimental program in which regular General Mathematics 9, 10, and 11 courses were supplemented by instruction in business machines was evaluated. Results of the Test of Mathematical Fundamentals and the Mathematics Test Supplement (see sample, Appendix A) showed no significant superiority in achievement for students in the experimental group over students in the regular program. (MS)

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RESEARCH REPORT

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# An Evaluation of a Business Machines Course for General Mathematics Students

July, 1971

R. L. Peacock & A. G. Moodie

Research Report 71-15

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Department of Planning and Evaluation
Board of School Trustees
1595 West 10th Avenue
Vancouver 9, B. C.

# AN EVALUATION OF A BUSINESS MACHINES COURSE FOR GENERAL MATHEMATICS STUDENTS

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## ACKNOWLEDGMENT

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(1) the principals of Churchill and Point Grey Secondary Schools, and

(2) the teachers who administered the Beattie Test of Mathematical Fundamentals and the Mathematics Test Supplement to the General Mathematics students at Churchill and Point Grey Secondary Schools.

# AN EVALUATION OF A BUSINESS MACHINES COURSE FOR GENERAL MATHEMATICS STUDENTS

## Introduction

During 1970-71 an experimental program was initiated for General Mathematics students at Point Grey Secondary School. In this experimental program the regular General Mathematics 9, 10 and 11 courses were supplemented by instruction and practice with business machines. The introduction to business machines was designed to enhance the relevancy of mathematics instruction for students.

## Evaluation of the Program

To determine the effectiveness of the experimental program in developing the mathematical abilities of students, the following instruments were administered in pre-test sessions during November, 1970 and in post-test sessions during May, 1971.

(a) Test of Mathematical Fundamentals[1] by H. R. Beattie

(b) Mathematics Test Supplement by R. L. Peacock

The test scores of the experimental group were compared statistically with those of a control group of students in the regular General Mathematics 9, 10 and 11 programs at Sir Winston Churchill Secondary School.

## Comparison of the Experimental and Control Groups

To determine the significance of changes in mathematical achievement, a statistical test ("t" test) was used for comparing:

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[1] Test of Mathematical Fundamentals by H. R. Beattie (Toronto: The Guidance Centre, Ontario College of Education, 1952.)

(a) the pre-test raw scores of the experimental group with those of the control group (see Table I),

(b) the pre- and post-test raw scores for both experimental and control groups (see Table II), and

(c) the changes in raw test scores received by the experimental group with those received by the control group (see Table III).

In comparing the fluctuations in achievement for the experimental and control groups, only the scores of students who had written both pre- and post-tests were used as data in the statistical analysis of each evaluation instrument.

In Table I a pre-test comparison showed that the experimental group had a lower mean score (statistically significant at the .01 level) on the Beattie Test of Mathematical Fundamentals than the control group. There was no statistically significant difference between mean scores of the experimental and control groups on the Mathematics Test Supplement.

In the pre- and post-test comparisons of the Beattie Test of Mathematical Fundamentals raw scores, both experimental and control groups made gains that were statistically significant at the .01 level as shown in Table II. In similar comparisons for the Mathematics Test Supplement, the losses in mean score for both experimental and control groups were not statistically significant.

In Table III there were no statistically significant differences between the experimental and control groups in the mean gains made on the Beattie Test of Mathematical Fundamentals and the mean losses they both received on the Mathematics Test Supplement.

Limitations of the Study

Unlike the Beattie Test of Mathematical Fundamentals for which one mark was given to each correct answer, there were multiple combinations of marks assigned to some questions in the Mathematics Test Supplement. The poorer post-test performance on the Mathematics Test Supplement may have been caused by the post-test marker scoring the questions more rigorously (i. e. assigning fewer marks for partial answers) than the pre-test marker. Although it was not possible to have the same person marking both pre- and post-tests, each marker endeavoured to maintain a consistency in scoring the tests of the experimental and control groups.

Conclusion

During this evaluation, the experimental and control groups made similar mean gains in scores on the Beattie Test of Mathematical Fundamentals and similar mean losses in scores on the Mathematics Test Supplement. As measured by the two tests, the study revealed no statistically significant superiority in achievement for students in the experimental group with business machines as compared to students in the regular General Mathematics program.

TABLE I: ANALYSES BY "t" TEST OF PRE-TEST RAW SCORES FOR STUDENTS IN THE EXPERIMENTAL GROUP AND THE CONTROL GROUP, NOVEMBER, 1970.

| | BEATTIE TEST OF MATHEMATICAL FUNDAMENTALS | | MATHEMATICS TEST SUPPLEMENT | |
|---|---|---|---|---|
| | Experimental | Control | Experimental | Control |
| Number of Subjects | 46 | 56 | 46 | 56 |
| Mean Score | 20.52 | 25.80 | 15.89 | 14.59 |
| Standard Deviation | 7.63 | 8.90 | 5.71 | 6.90 |
| Difference Between Means | - 5.28 | | + 1.30 | |
| "t" Value | 3.19** | | 1.03 (n. s. d.) | |

Legend: ** significant at the .01 level
n. s. d. no significant difference

TABLE II: ANALYSES BY "t" TEST OF PRE- AND POST-TEST RAW SCORES FOR STUDENTS IN THE EXPERIMENTAL AND CONTROL GROUPS

| | BEATTIE TEST OF MATHEMATICAL FUNDAMENTALS | | | |
|---|---|---|---|---|
| | Experimental Group | | Control Group | |
| | Pre-Test | Post-Test | Pre-Test | Post-Test |
| Number of Subjects | 46 | 46 | 56 | 56 |
| Mean Score | 20.52 | 24.26 | 25.80 | 29.62 |
| Standard Deviation | 7.63 | 7.58 | 8.90 | 10.20 |
| Difference Between Means | + 3.74 | | + 3.82 | |
| "t" Value | 2.33** | | 2.09** | |

| | MATHEMATICS TEST SUPPLEMENT | | | |
|---|---|---|---|---|
| | Experimental Group | | Control Group | |
| | Pre-Test | Post-Test | Pre-Test | Post-Test |
| Number of Subjects | 46 | 46 | 56 | 56 |
| Mean Score | 15.89 | 14.41 | 14.59 | 13.07 |
| Standard Deviation | 5.71 | 5.83 | 6.90 | 4.73 |
| Difference Between Means | - 1.48 | | - 1.52 | |
| "t" Value | 1.22 (n. s. d.) | | 1.35 (n. s. d.) | |

Legend: ** significant at the .01 level
n. s. d. no significant difference

TABLE III: ANALYSES BY "t" TEST OF CHANGES IN RAW SCORES RECEIVED BY THE EXPERIMENTAL GROUP AND THE CONTROL GROUP

| | BEATTIE TEST OF MATHEMATICAL FUNDAMENTALS | | MATHEMATICS TEST SUPPLEMENT | |
|---|---|---|---|---|
| | Experimental | Control | Experimental | Control |
| Number of Subjects | 46 | 56 | 46 | 56 |
| Mean Change | + 3.74 | + 3.82 | - 1.48 | - 1.52 |
| Standard Deviation | 5.72 | 4.76 | 6.80 | 5.55 |
| Difference Between Means | - 0.08 | | + 0.04 | |
| "t" Value | 0.08 (n.s.d.) | | 0.03 (n.s.d.) | |

Legend: n.s.d. no significant difference

# APPENDIX A

## MATHEMATICS TEST SUPPLEMENT

## MATHEMATICS TEST SUPPLEMENT

NAME _____

CLASS _____ SCHOOL _____

I. Write the base ten numerals (decimal numbers) for the following numerals written in various bases as indicated by brackets.

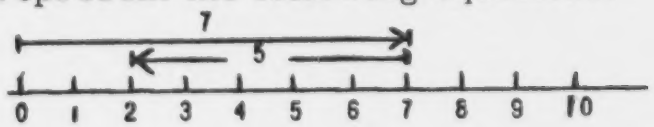
e. g. $11_{(2)} = \underline{3}$ and $212_{(3)} = \underline{23}$

---

1. $101_{(2)} =$ _____
2. $11_{(4)} =$ _____
3. $2011_{(3)} =$ _____
4. $115_{(6)} =$ _____
5. $46_{(7)} =$ _____
6. $121_{(12)} =$ _____

II. Use the number line to represent the following equations:

e. g. $7 - 5 = 2$

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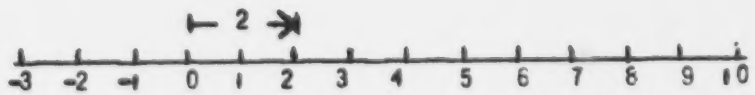
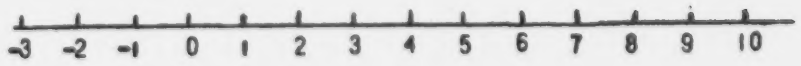
1. $2 + 6 = 8$




2. $8 - 9 = -1$



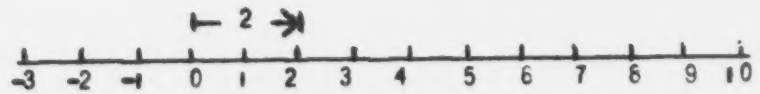

III. Give the number for the point as indicated by each letter. Start with A.

1.

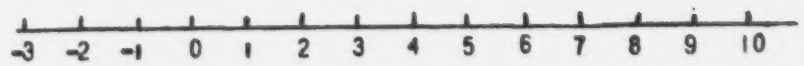
0 1 2 3 4 5 6 7 8 9 10

---

1. $2 + 6 = 8$




2. $8 - 9 = -1$

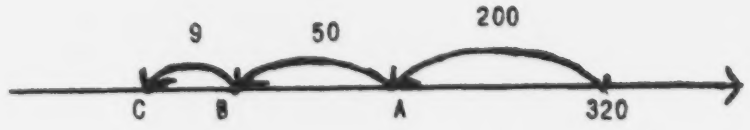



III. Give the number for the point as indicated by each letter. Start with A.

1.

— — —

2.

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— — —

IV. Each table gives several number pairs for the same ratio. Give the missing numbers.

A

| | |
|---|---|
| 2 | 1 |
| 4 | 2 |
| 6 | |
| 8 | |
| | 5 |

B

| | |
|---|---|
| 3 | 2 |
| 6 | 4 |
| 9 | |
| 12 | |
| | 10 |

C

| | |
|---|---|
| 4 | 5 |
| 8 | |
| 12 | |
| | 20 |
| 20 | |

D

| | |
|---|---|
| 3 | 4 |
| 6 | |
| | 12 |
| 12 | |
| | 20 |

V. The Smith family drove 280 miles on a tank of gasoline. The tank held 15 gallons. About how many miles could they expect to drive on 5 gallons of gasoline?

T1 001 0690 12